

10/526018

-15-

15228-15PCT
OS-19PCT

BT01 Rec'd PCT/PTC 25 FEB 2005

WHAT IS CLAIMED IS:

1. An apparatus for planning a surgery, the apparatus comprising:
 - a display for an image representing a patient's anatomy;
 - a database of virtual implants from which a user selects;
 - a tool for said user to manipulate in order to select said virtual implants from said database and place said virtual implants in said image at desired locations; and
 - a positioning module adapted to calculating a position of a first of said virtual implants with respect to a second of said virtual implants and allow said user to align said first and second virtual implants with respect to each other, adapted to generating relative position data as a function of said calculated position, and adapted to sending said relative position data to said display.
2. An apparatus as claimed in claim 1, wherein said calculating a position comprises determining how well said virtual implants fit along a curve representing an interconnecting member for said virtual implants.
3. An apparatus as claimed in claim 1, wherein said surgery is a spinal surgery, said virtual implants are at least two spinal implants, and said positioning module is for aligning said at least two spinal implants along a curve representing an interconnecting member for said spinal implants.
4. An apparatus as claimed in claims 1, 2 or 3, wherein said tool allows said user to input a desired relative position of said first virtual implant with respect to said second virtual implant, and said positioning module updates a position of at least one of said first virtual implant and said second virtual implant as a function of said desired relative position.

5. An apparatus as claimed in claims 1, 2 or 3, wherein said tool allows said user to group together a plurality of virtual implants and input a desired relative position of said plurality of virtual implants with respect to another of said virtual implants, and said positioning module updates a position of at least one of said plurality of virtual implants and said another virtual implant as a function of said desired relative position.

6. An apparatus as claimed in claims 1, 2 or 3, wherein said positioning module updates a position of a first virtual implant after said second virtual implant has been placed by said user at said desired location as a function of a predetermined relative position criteria.

7. An apparatus as claimed in claims 1, 2 or 3, wherein said relative position data is graphically represented by said display.

8. An apparatus as claimed in claims 1, 2 or 3, wherein said display is for displaying a fluoroscopic image representing said patient's anatomy.

9. An apparatus as claimed in claim 8, wherein said display updates said image every time a new fluoroscopic image is taken of said patient's anatomy.

10. An apparatus as claimed in claims 1, 2 or 3, wherein said relative position data comprises an entry point of said virtual implants in said anatomy.

11. An apparatus as claimed in claims 1, 2 or 3, wherein said relative position data comprises orientation of said virtual implants in said anatomy.

12. An apparatus as claimed in claims 1, 2 or 3, wherein said relative position data comprises depth information of said virtual implants in said anatomy.

5 13. A computer aided surgery system for placing implants comprising an apparatus for planning a surgery as defined claims 1 to 12 and a tracking module for tracking tools during said surgery.

14. A method for placing at least two spinal implants during a surgery using a computer assisted surgery system, the method comprising:

10 providing an image representing a patient's anatomy;

determining a desired curve along which said at least two spinal implants are to be placed and representing said curve on said image, said desired curve corresponding to an interconnecting member for said at least two spinal implants;

15 selecting at least two virtual implants from a database of virtual implants to correspond to said at least two spinal implants;

placing said at least two virtual implants on said desired curve in said image by aligning said at least two virtual implants with said desired curve while taking into account a position of a preceding virtual implant to place a subsequent virtual implant; and

20 placing said at least two spinal implants according to said virtual implants in said image using said computer assisted surgery system.

25 15. A method as claimed in claim 14, wherein said placing said at least two virtual implants comprises using lines to join together said virtual implants and align them on said image representing a patient's anatomy.

16. A method as claimed in claim 14, wherein said placing said at least two virtual implants comprises calculating a location for said subsequent virtual implant based

on a location of said preceding virtual implant.

5 17. A method as claimed in claim 14, wherein said selecting said at least two virtual implants comprises selecting said subsequent virtual implant having one of a position and a shape based on constraints imposed by said preceding virtual implant.

10 18. A method as claimed in claim 14, wherein said placing said at least two virtual implants comprises re-adjusting a position of said preceding virtual implant to better position said subsequent virtual implant in order to achieve an optimal alignment of all of said virtual implants.

15 19. A method as claimed in claim 14, wherein said at least two virtual implants are three virtual implants, and said interconnecting member is a rod to interconnect three spinal implants.

20 20. A method as claimed in claim 19, wherein said placing said at least two virtual implants comprises grouping together two of said three virtual implants and positioning said two virtual implants according to a desired relative position to at least one other virtual implant.

25 21. A method as claimed in claim 14, wherein said placing said at least two virtual implants comprises determining at least one of an entry point, a depth, and an orientation of each of said virtual implants on said anatomy.

22. A method as claimed in claim 14, wherein said placing said at least two virtual implants comprises placing according to predetermined relative position criteria.

26-10-2004

0:51 FAX 514 288 5474

OGILVY RENAULT

005 06.10.2004

005/009

CA0301248

15228-15PCT
OS-19PCT

-19-

23. A method as claimed in claim 14, wherein said providing an image comprises providing a fluoroscopic image.

24. A method as claimed in claim 23, wherein said placing said at least two spinal implants comprises updating said fluoroscopic image after each of said at least two spinal implants has been placed.

25. A computer readable memory for storing programmable instructions for use in the execution in a computer of the method of any one of claims 14 to 24.

26. A computer data signal embodied in a carrier wave comprising data resulting from a positioning module adapted to calculating a position of a first virtual implant with respect to a second virtual implant and allow a user to align said first and second virtual implants with respect to each other, adapted to generating relative position data as a function of said calculated position, and adapted to sending said relative position data to a display.

AMENDED SHEET